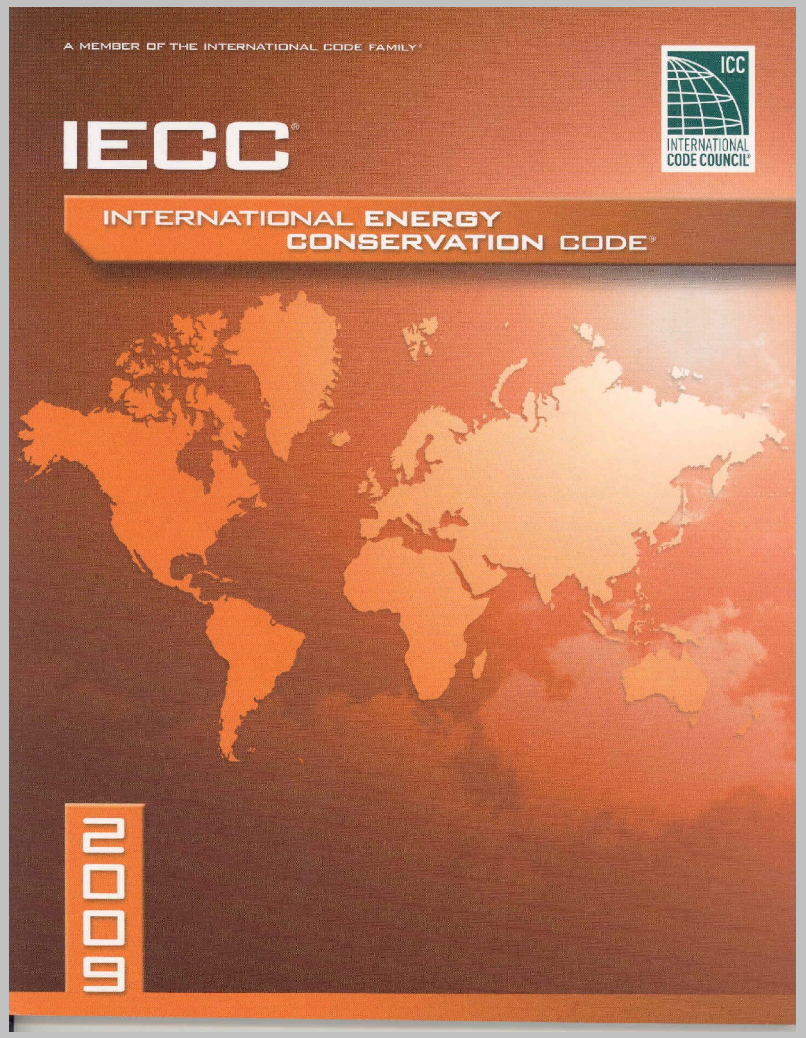
Residential Requirements

2009 International Energy Conservation Code (IECC)

Adopted May 18, 2010

All permit applications made after July 18, 2010 shall comply with this code.



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Structure of the IECC

- Chapter 1 Administrative
- Chapter 2 Definitions
- Chapter 3 Climate Zones
- Chapter 4 Residential Energy Efficiency
- Chapter 5 Commercial Energy Efficiency
- Chapter 6 Referenced Standards

Residential Chapter

Relationship Between IRC and IECC

- IECC addresses only energy
- IRC addresses all other codes for residential detached one and two family dwellings and townhouses
- IECC now replaces Chapter 11 of the IRC

Overview of Residential Code Requirements

- Focus is on building envelope
  - Ceilings, walls, windows, floors, foundations
  - Sets insulation levels and window U-factors
  - Infiltration control - caulk and seal to prevent air leaks
- Ducts – seal, insulate and pressure test
- Limited space heating, air conditioning, and water heating requirements
  - Federal law sets most equipment efficiency requirements, not the I-codes
- No appliance efficiency requirements
- Lighting equipment – 50% of lamps to be high-efficacy lamps

What's Changed Since IECC 2006?

- Stringency – some key differences
- New requirements
  - Building envelope tightness
  - Duct testing
  - Lighting equipment
  - Pool controls and covers
  - Snow melt controls
- Moisture control requirements moved to IRC
- No mechanical trade-offs allowed

Code changes 2006-2009

	2006 IECC Changes	2009 IECC Changes
Chapter 1 Administration		
	Section 101.4 Applicability. (No changes)	*Section 101.4 Applicability*. New text for the main heading of this section reads: "Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern".
	Section 101.4.3 Additions, alterations, renovations or repairs. (No changes)	*Section 101.4.3 Additions, alterations, renovations or repairs*. This section has undergone significant change and has included several new exceptions, new text reads: "Additions. Alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of the code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. **Exception**: the following need not comply provided the energy use of the building is not increased". **1**. Storm windows installed over existing fenestration. **2**. Glass only replacements in an existing sash and frame. **3**. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation. **4**. Construction where the existing roof, wall or floor cavity is not exposed. **5**. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above of below the sheathing. **6**. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separate a conditioned space from the exterior shall not be removed. **7**. Alterations that replace less than 50% of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

Certificate

- Permanently posted on the electrical distribution panel
- Don’t cover or obstruct the visibility of other required labels
- Includes the following:
  - R-values of insulation installed for the thermal building envelope including ducts outside conditioned spaces
  - U-factors for fenestration
  - HVAC efficiencies and types
  - Service water heating equipment
  - Room heating equipment

Sample certificate

Energy Efficiency Certificate

Insulation Ratings	R-Values
Ceiling/Roof	
Walls	
Foundation Walls	
Slab	
Crawlspace Walls	
Crawlspace Floor	
Ductwork in Unconditioned Space	
Fenestration Ratings	**U-Values**
Windows	
Doors	
HVAC Equipment	**AFUE or EER/SEER**
Furnace: Gas__Elect__Oil__	
Heatpump	
Boiler: Gas__Oil__	
Cooling	
Water Htr: Gas__Elect__Oil__	

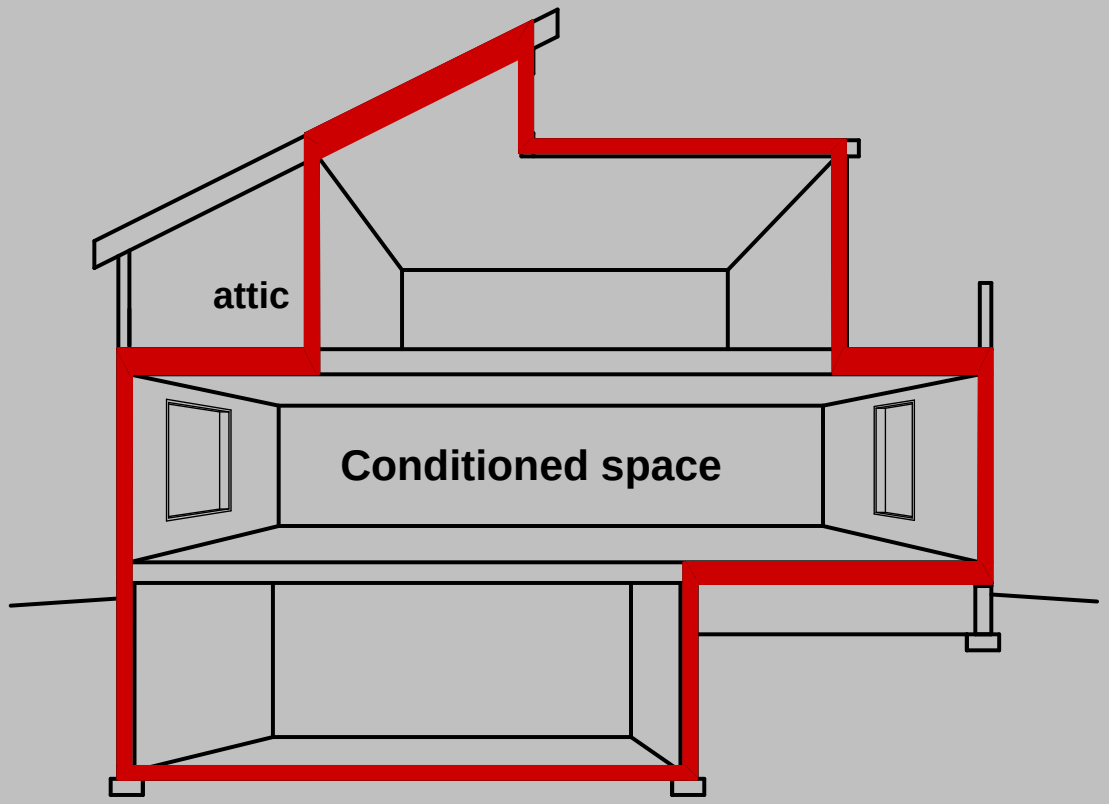
Room Heaters	Yes: #	No
Gas Fired		
Electric Furnace		
Baseboard Heat		

Address	Permit #

Builder/Designer	Signature	Date

Building Envelope Specific Requirements

- Building (Thermal) Envelope consists of:
  - Fenestration
  - Ceilings
  - Walls
    - Above grade
    - Below grade
    - Mass walls
  - Floors
  - Slab
  - Crawl space

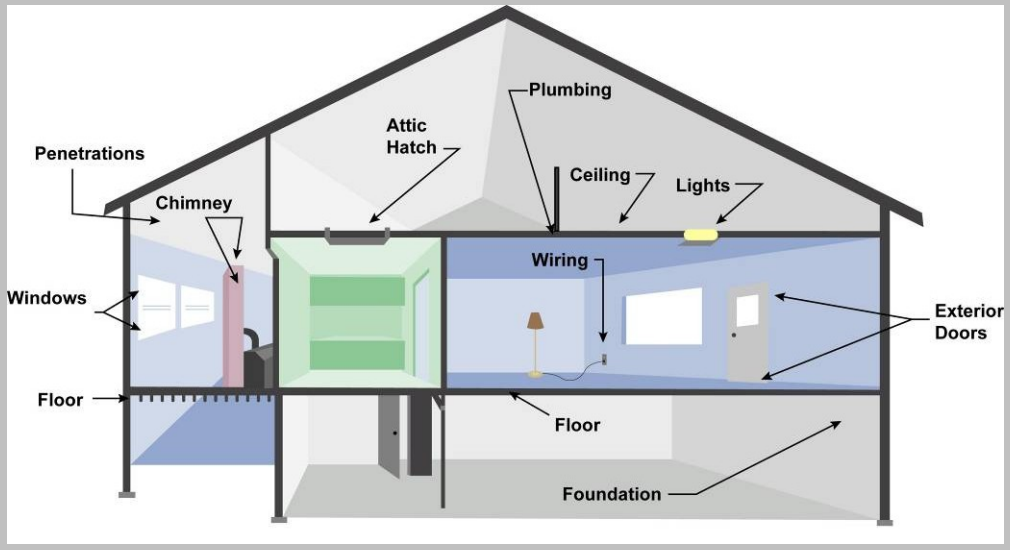


Exceptions to Meeting Building Thermal Envelope Provisions

- Very low energy use buildings (<3.4 Btu/h-ft^2 or 1 watt/ft^2)
- Buildings (or portions of) that are neither heated nor cooled
- Existing buildings (Section 101.4.1)
  - Maryland rehabilitation code applies
  - Electrical power, lighting, and mechanical systems may still apply
- Buildings designated as historic (Section 101.4.2)

Mandatory Requirements Building Envelope

- Air leakage
- Systems
- Maximum fenestration U-factor



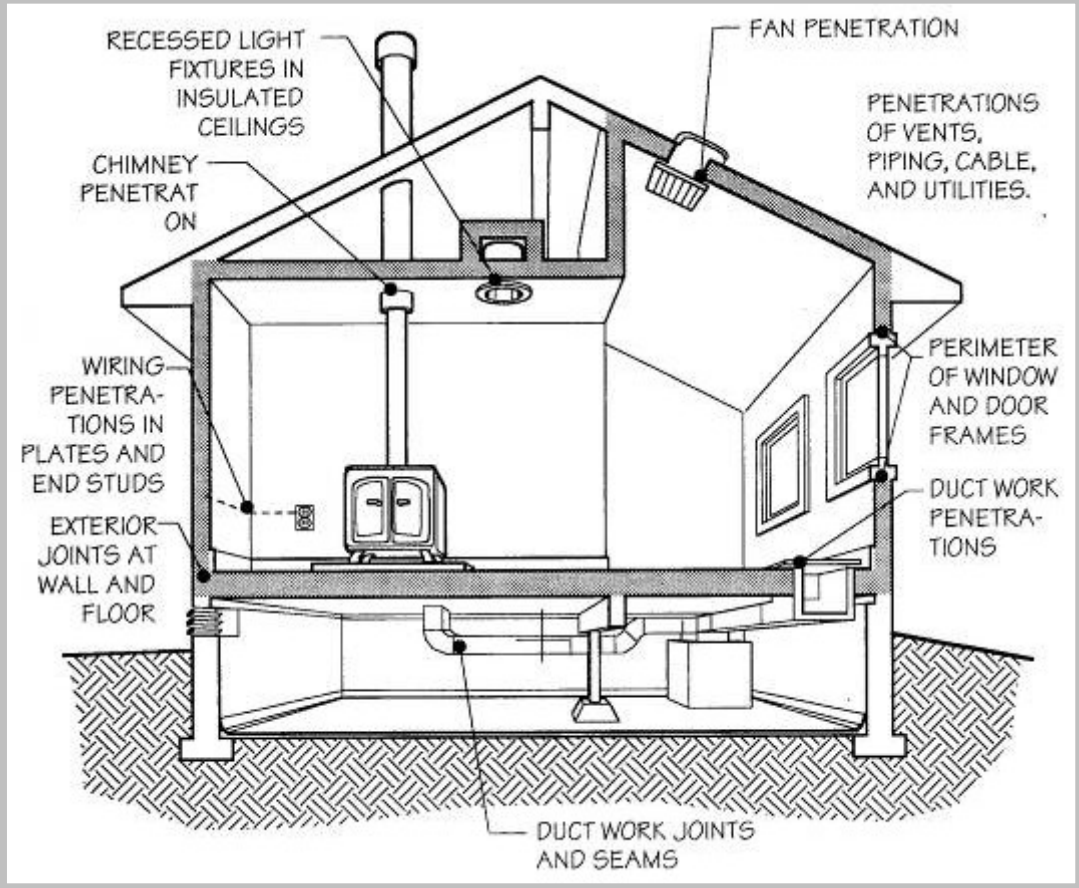
Air Leakage Control

Mandatory Requirements

- Building envelope
  - Sealed with caulking materials or
  - Closed with gasketing systems
  - Joints and seams sealed or taped or covered with a moisture vapor-permeable wrapping material

Areas for Air Leakage (Infiltration)

- Windows and doors
- Between sole plates
- Floors and exterior wall panels
- Plumbing
- Electrical
- Service access doors or hatches
- Recessed light fixtures
- Rim joist junction



Recessed Lighting Fixtures

Mandatory Requirements

- Type IC rated and labeled in a sealed or gasketed enclosure
- Type IC rated and labeled as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm of air movement
- Sealed with a gasket or caulk between the housing and interior wall or ceiling covering

Additions, Alterations, Renovations, Repairs

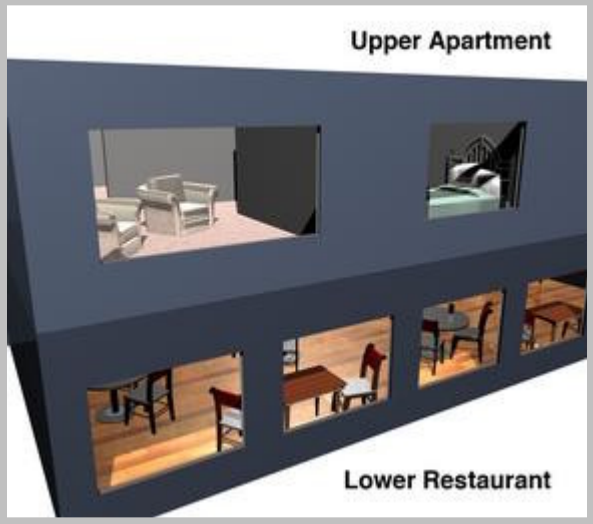
- Conform as relates to new construction
- Unaltered portions) do not need to comply
- Additions can comply alone or in combination with existing building
- Exceptions
  - Storm windows over existing fenestration
  - Glass only replacements
  - Exposed, existing ceiling, wall or floor cavities if already filled with insulation
  - Where existing roof, wall or floor cavity isn't exposed
  - Reroofing for roofs where neither sheathing nor insulation exposed
    - Roofs, insulate above or below the sheathing when:
      - Roofs without insulation in the cavity
      - Sheathing or insulation is exposed

Change in Space Conditioning

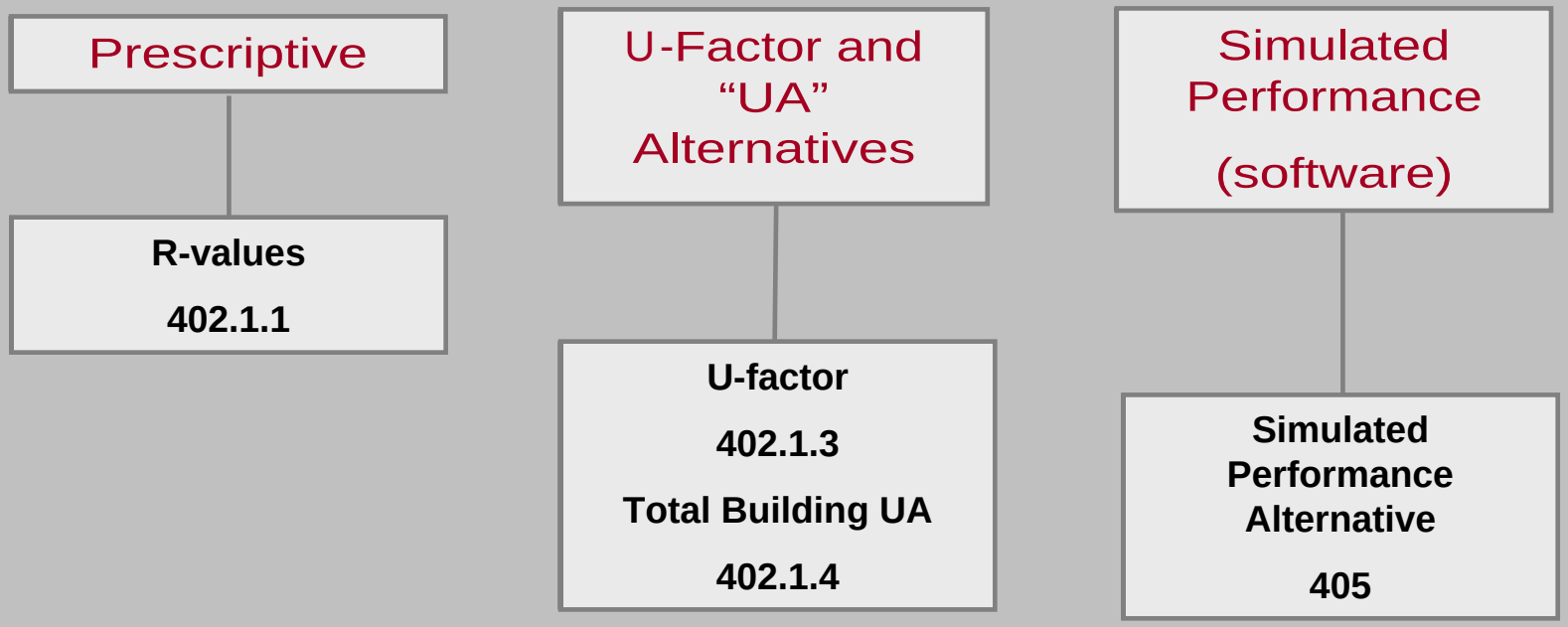
- Any nonconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this code.

Mixed Use Buildings

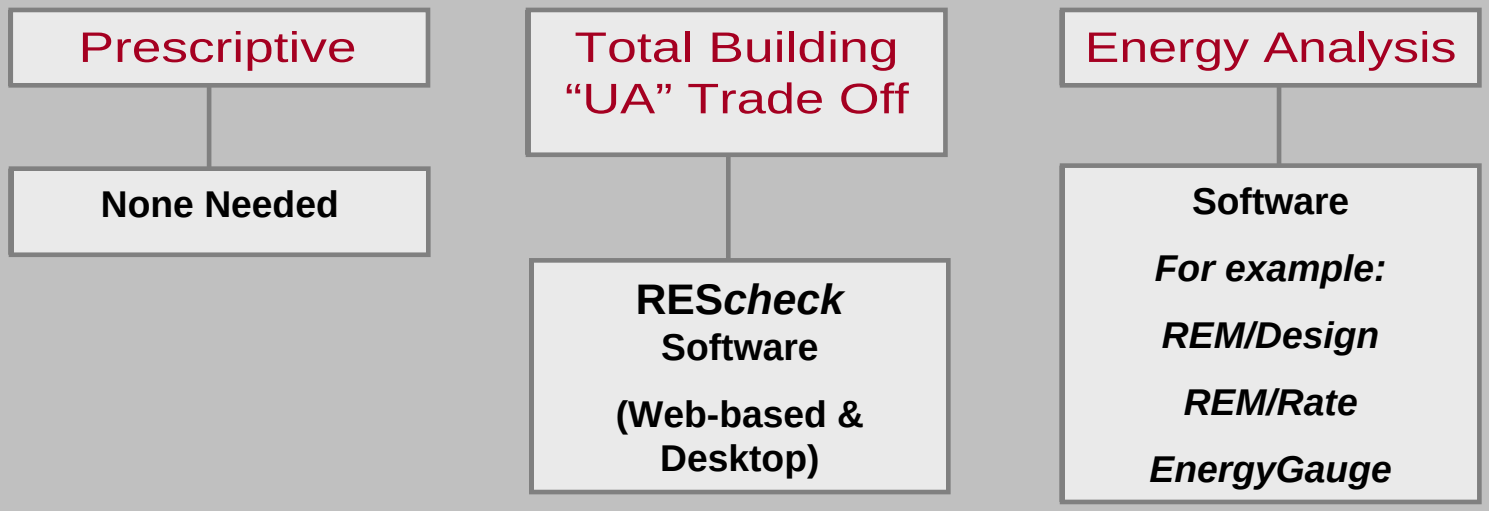
- Mixed occupancies
  - Treat the residential occupancy under the applicable residential code
  - Treat the commercial occupancy under the commercial code



IECC Compliance - Three Options



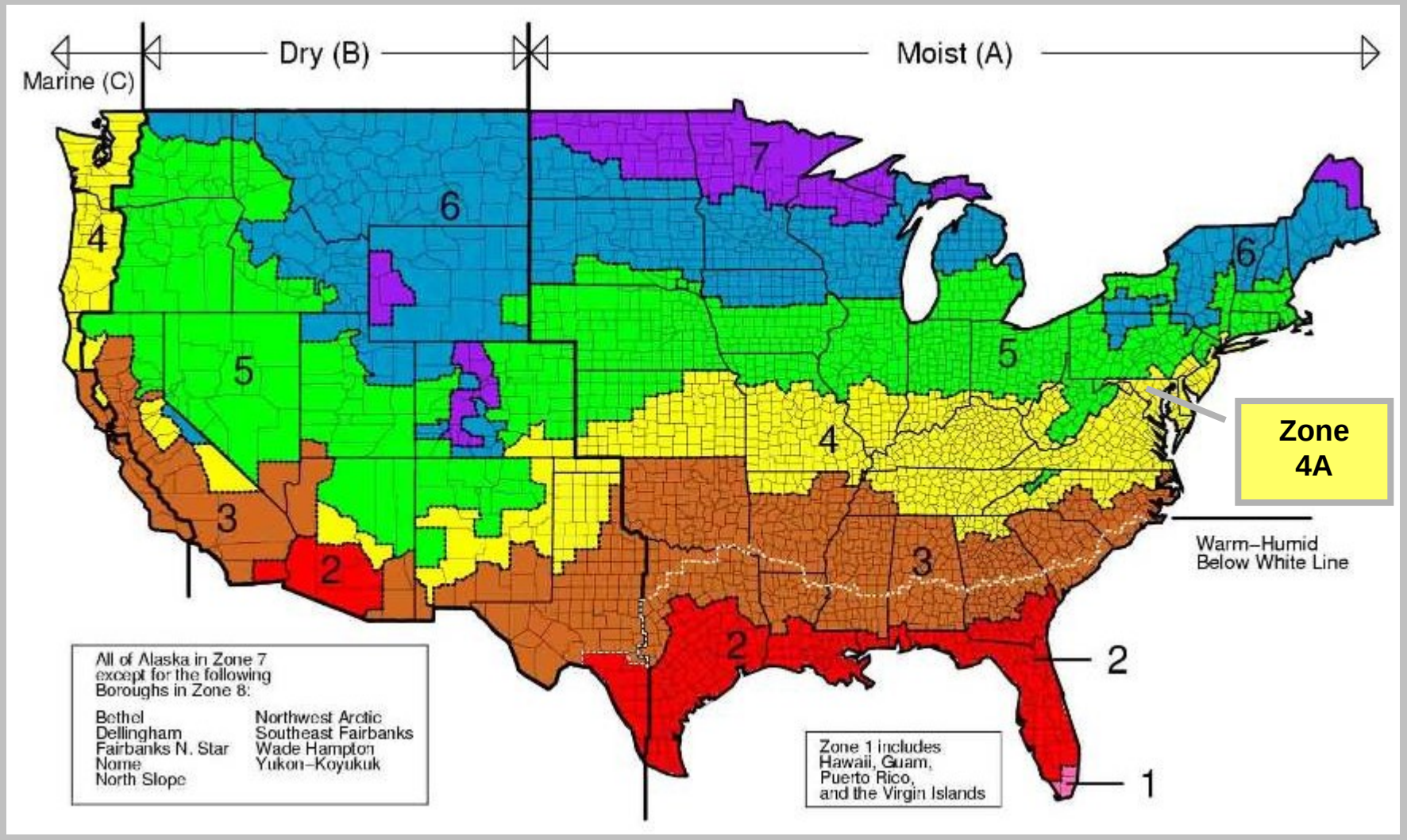
Code Compliance Tools



U-Factor and Total UA (RES*check* Approach)

- U-factor Alternative
  - Similar to Prescriptive but uses U-factors instead of R-values
    - Allows for innovative or less common construction techniques such as structural insulated panels or log walls
- Total UA Alternative
  - Same as U-factor alternative but allows trade-offs across all envelope components
    - Approach used in RES*check* software

Climate Zones—2009 IECC



Insulation and Fenestration Requirements by Climate Zone

Table 402.1.1
Insulation and Fenestration Requirements by Component[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[b]	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION[b,e] SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE[i]	FLOOR R-VALUE	BASEMENT[c] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c] WALL R-VALUE
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65[j]	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50[j]	0.65	0.30	30	13	5 / 8	19	5 / 13[f]	0	5 / 13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10 / 13	10, 2ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5[h]	13 / 17	30[g]	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5[h]	15 / 19	30[g]	15 / 19	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38[g]	15 / 19	10, 4 ft	10 / 13

a. *R*-values are minimums, *U*-factors and SHGC are maximums, R-19 batts compressed into a nominal 2 x 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.
b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
c. "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
e. There are no SHGC requirements in the Marine Zone.
f. Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.
g. Or insulation sufficient to fill the framing cavity, R-19 minimum.
h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.
j. For impact rated fenestration complying with Section R301.2.1.2 of the *IRC* or Section 1608.1.2 of the *IBC*, maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

U-Factor Requirements by Climate Zone

Table 402.1.3
Equivalent U-Factors[a]

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR[b]	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR[d]	CRAWL SPACE WALL U-FACTOR[c]
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091[c]	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

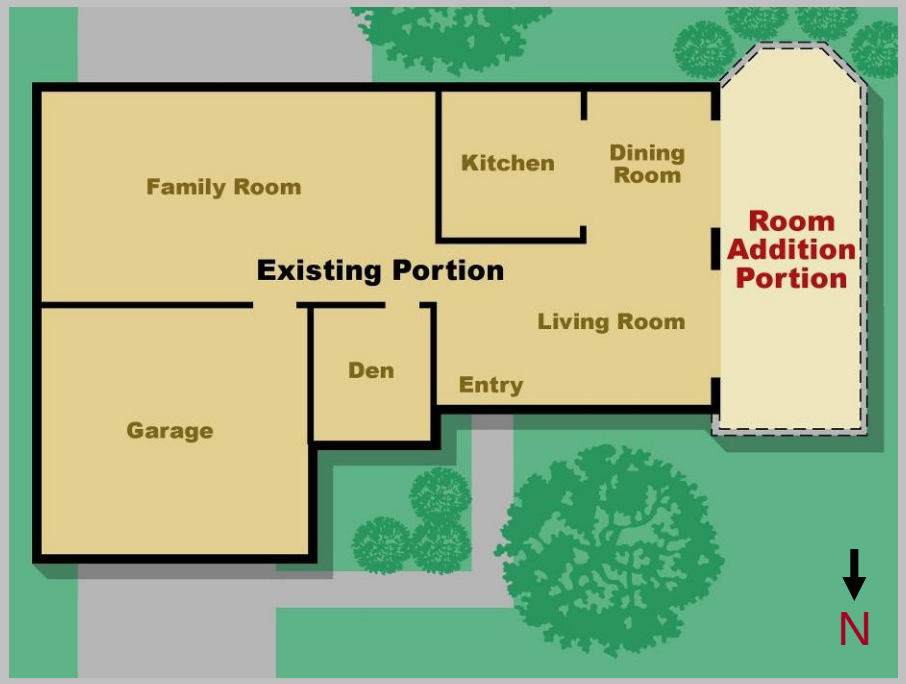
a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
b. When more than half the insulation is on the interior, the mass wall *U*-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall *U*-factor in Marine Zone 4 and Zones 5 through 8.
c. Basement wall *U*-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.

Simulated Performance Alternative

- Requires computer software with specified capabilities (local official may approve other tools)
- Includes both envelope and equipment
- Allows greatest flexibility. Credits features such as:
  - High efficiency furnaces, air-conditioners, etc.
  - Tight ducts (must be leak tested) or hydronic systems
  - Exterior shading, favorable orientation, thermal mass, SHGC, etc.
- Section 405 specifies “ground rules”
  - These will generally be “hidden” in compliance software calculation algorithms
  - Very similar ground rules are used in home federal tax credits and ENERGY STAR Home guidelines

Additions

- Treat as a stand-alone building
- Additions must meet the prescriptive requirements in Table 402.1.1



Sunrooms

Less stringent insulation R-value and glazing U-factor requirements

Sunroom definition:

- Glazing area >40% glazing of gross exterior wall and roof area
- Separate heating or cooling system or zone
- Must be thermally isolated (closeable doors or windows to the rest of the house)

Mechanical Systems & Equipment

- Equipment efficiency set by Federal law, not the I-Codes

Mandatory Requirements Systems (Section 403)

- Controls
- Heat pump supplementary heat
- Ducts
  - Sealing (Mandatory)
  - Insulation (Prescriptive)
- HVAC piping insulation
- Circulating hot water systems insulation
- Ventilation, automatic or gravity dampers
- Equipment sizing in accordance with IRC M1401.3
- Systems serving multiple dwelling units, sections 503 and 504 of the commercial requirements
- Snow melt controls
- Pools

Programmable Thermostat - Controls

Mandatory Requirements

- If primary heating system is a forced-air furnace
  - At least one programmable thermostat/dwelling unit
  - Capability to set back or temporarily operate the system to maintain zone temperatures
    - down to 55ºF (13ºC) or
    - up to 85ºF (29ºC)
  - Initially programmed with:
    - heating temperature set point no higher than 70ºF (21ºC) and
    - cooling temperature set point no lower than 78ºF (26ºC)

Duct Tightness Tests

Mandatory Requirements

- All ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed (Section 403.2.2)
- Duct tightness shall be verified *by either* -
  - Post construction test
    - Leakage to outdoors: =8 cfm/per 100 ft^2 of conditioned floor area **or**
    - Total leakage: =12 cfm/per 100 ft^2 of conditioned floor area
      - tested at a pressure differential of 0.1 in w.g. (25Pa) across entire system, including manufacturer's air handler enclosure
    - All register boots taped or otherwise sealed

OR

  - Rough-in test
    - Total leakage =6 cfm/per 100 ft^2 of conditioned floor area
      - tested at a pressure differential of 0.1 in w.g. (25Pa) across roughed-in system, including manufacturer's air handler enclosure
      - all register boots taped or otherwise sealed
      - if air handler not installed at time of test
        - Total air leakage =4 cfm/per 100 ft^2

    Exceptions: Duct tightness test is not required if the air handler and all ducts are located within conditioned space

Snow Melt System Controls

Mandatory Requirements

- Snow- and ice-melting system controls
  - pavement temperature > 50ºF and no precipitation is falling and when the outdoor temperature is > 40ºF

Pools

Mandatory Requirements

- Pool heaters
  - with a readily accessible on-off switch
  - fired by natural gas not allowed to have continuously burning pilot lights
- Time switches to automatically turn off and on heaters and pumps according to a preset schedule installed on swimming pool heaters and pumps.
  - Exceptions
    - Public health standards require 24-hour pump operation
    - Pumps operating pools with solar-waste-heat recovery heating systems

Pool Covers

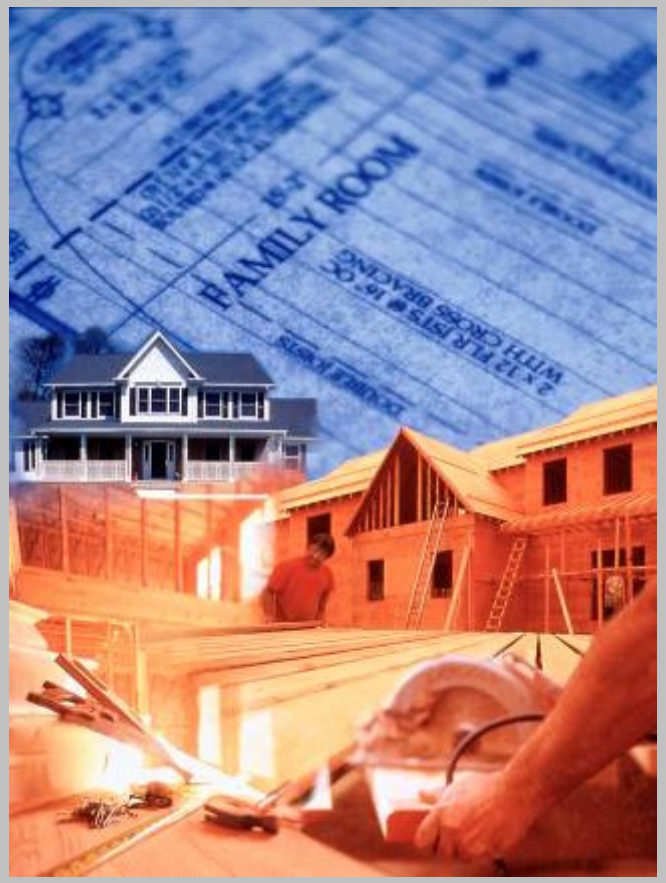
Mandatory Requirements

- On heated pools
  - If heated to >90°F, vapor-retardant pool cover at least R-12

  Exception: If >60% of energy from site-recovered or solar energy source

Compliance/Documentation

- Code Official has final authority
  - Software, worksheets
  - Above Code Programs
- Construction work for which a permit is required is subject to inspection
- Certificate is required

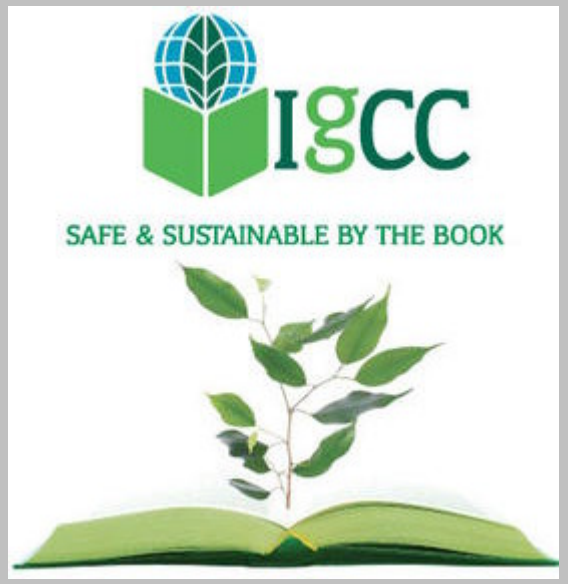


Compliance/Inspections

2009 IECC Residential Field Inspection Checklist		
(In addition to IRC requirements)		
Refer to Compliance Certificates for Project-Specific Requirements		
Foundation and or Slab/Under-Floor Inspection		
Requirement	Verify	Reference
Slab edge insulation R-value and depth	R-value and depth	(401.3) Approved plans (On-site)
Basement/Below-grade wall insulation	R-value	(401.3) Approved plans (On-site)
Crawl space/Under-floor insulation	R-value	(401.3) Approved plans (On-site)
Duct sealing and insulation	Joint sealing and R-value	(401.3) Approved plans (On-site)
Framing Inspection		
All joints and penetrations are caulked/gasketed	Visual Inspection	Table 402.4.2
Ductwork sealing and insulation	Verify by pressure test or visual inspection	Third party or visual 403.2
Fenestration air-leakage	By label	To standards (402.4.4)
Fenestration and skylight areas	Area of windows and skylights	Approved plans
Fenestration and skylight U-factors	By label	Approved plans and certificate
Insulation Inspection		
Wall insulation installed	By wall construction type/visual inspection	Approved plans and certificate
Ceilings or roof insulation Tables	Visual inspection	Approved plans and certificate
Vapor barrier	Visual inspection	402.2.9 Crawlspace
Duct sealing and insulation	Visual joint sealing and R-value	IECC/IRC and Certificate (On-site)
Access hatches and doors	Visual/R-value and sealing	402.2.3
Final Inspection		
HVAC system controls	1 thermostat per system, programmable if forced air	403.1.1
Ducts insulation, sealing and tightness	Pressure test when outside therm envelope	403.2 Third party or visual
Building envelope tightness	Blower door test or 402.4.2 verified	Third party or 402.4.2
Recessed lighting	IC rated and sealed (unless in conditioned space)	402.4.2
Lighting	50%/high efficacy, list from electrician/installer	404 or 405 Prescriptive or design
Fireplaces	Visual, gasketed and outdoor air	402.4.3
Mechanical system piping (insulation)	Visual inspection of insulation	403.3
Circulating hot water (insulation/switching)	Visual inspection of insulation and switching	403.4
Mechanical ventilation (dampers)	Visual inspection	403.5
Equipment efficiency	Visual verification	On-site certificate, approved plans
Snow melt systems (if applicable)	Visual inspection	403.8
Heated pools (covers, heaters and switches)	Visual inspection/verification	403.9
Maintenance information	Make certain maintenance documents on site	303.3

The future?...

2012 International Green Construction Code



Available for public view iccsafe.org

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Agenda

- Welcome and Opening Remarks
  - Hadi Mansouri, Division Chief
- Significant Local Changes to IRC 2009
  - George Muste and Steve Thomas, Managers
- Q & A
- IECC 2009 Code Provisions and Inspection Process
  - Mark Nauman, Plan Reviewer
- Q & A
- Residential Zoning - Additions and New Construction
  - Susan Scala-Demby, Manager
- Q & A